



University of Kentucky  
UKnowledge

---

International Grassland Congress Proceedings

21st International Grassland Congress / 8th  
International Rangeland Congress

---

## Role of Grazing Cattle on Seed Dispersal of Plants in a Hill Pasture 3. Seasonal Variation of Locations of Defecation by Cattle and its Effects on Germination of Seeds in Dung Pats

Shin-ichiro Ogura  
*Tohoku University, Japan*

M. Obara  
*Tohoku University, Japan*

T. Shishido  
*Tohoku University, Japan*

K. Sugawara  
*Tohoku University, Japan*

Follow this and additional works at: <https://uknowledge.uky.edu/igc>

 Part of the [Plant Sciences Commons](#), and the [Soil Science Commons](#)

This document is available at <https://uknowledge.uky.edu/igc/21/3-1/36>

The 21st International Grassland Congress / 8th International Rangeland Congress took place in Hohhot, China from June 29 through July 5, 2008.

Proceedings edited by Organizing Committee of 2008 IGC/IRC Conference

Published by Guangdong People's Publishing House

---

This Event is brought to you for free and open access by the Plant and Soil Sciences at UKnowledge. It has been accepted for inclusion in International Grassland Congress Proceedings by an authorized administrator of UKnowledge. For more information, please contact [UKnowledge@lsv.uky.edu](mailto:UKnowledge@lsv.uky.edu).

## Role of grazing cattle on seed dispersal of plants in a hill pasture 3 . seasonal variation of locations of defecation by cattle and its effects on germination of seeds in dung pats .

S . Ogura , M . Obara , T . Shishido and K . Sugawara

Graduate School of Agricultural Science , Tohoku University , Kawatabi , Naruko-onsen , Osaki , 989-6711 Japan . E-mail : s-ogurd@bios.tohoku.ac.jp

**Key words :** dung pats , environmental condition , grazing cattle , location , seed germination

**Introduction** Plant propagule dispersal by grazing herbivores is dependent on animal movements and defecation patterns in the landscape . Location of seed-laden dung can affect seed germination and plant establishment due to heterogeneous environmental conditions ( e.g . , solar radiation and moisture conditions ; Akber *et al .* 1995 ) . In this study , we investigated the effects of spatial and seasonal variation in a grazing pasture on seed germination rate and seedling survival of seeds embedded in dung pats .

### Materials and methods

**Seasonal variation of the location of defecation by grazing cattle** Two experimental areas ( Area I and II , 200 m×4 m each ) were selected within a 30 ha paddock where 69-115 cows with 38-46 calves were rotationally grazed . Soil type is nonallophanic Ando soil , and vegetation in both areas was similar except Area II included 42 .5% in coverage of broad-leaved forest . After the grazing period in May , August and October in 2005 , the degree of shading ( i.e . , lenient shading ( LS ) ; shading proportion of shading area by plants was <25% , medium shading ( MS ) ; 25-75% and heavy shading ( HS ) ; >75% and dominant plant species were recorded for all fresh dung pats in each area .

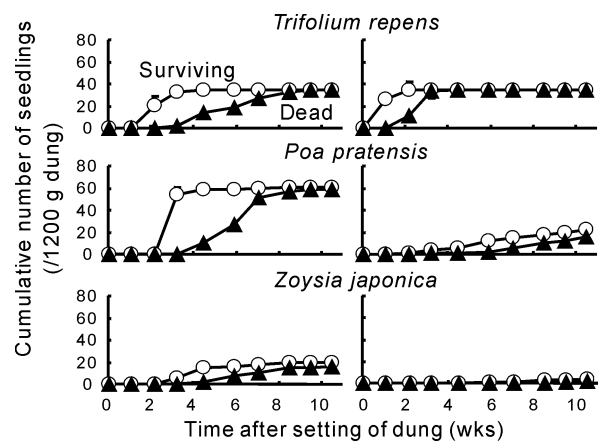
**The effects of environmental condition of dung on seed germination rate and survival of the seedlings** *Trifolium repens* , *Poa pratensis* and *Zoysia japonica* seeds were mixed with dung of a single dairy cow fed grass silage ( neither anti-parasitic medication nor ionophores were dosed ) , respectively ( 1 500 seeds/1 200 g of fresh dung pats , n=3 ) . The dung pats (  $\phi$ =20 cm ) were placed on a pasture , after cutting the sward to a height of 3 cm . Two treatments ; i.e . , sunshine ( SUN , photosynthetic photon flux density ( PPFD ) = 667  $\mu$  mol/s · m<sup>2</sup> ) and shading ( SHA , PPFD was controlled to be same as understory of the forest ; 16  $\mu$  mol/s · m<sup>2</sup> ) were established , and the number of germinating seeds and seedlings mortality were recorded from 21 June to 5 September , 2005 , at a 7-10 days interval . The temperature and moisture condition in the dung were monitored using WatchDog<sup>TM</sup> sensors and data loggers ( Model 400 ; Spectrum Technologies , Inc . ) .

**Results and discussion** While most dung pats were located in sunny place ( LS ; 62-91% ) , the proportion of HS increased in August ( 17% ) compared to June ( 3% ) and October ( 0% ) . This was due that cattle rested and defecated in shaded areas such as forested locations to avoid high daytime temperatures in summer ( Yasue *et al .* , 2000 ) . Variation of temperature in the dung pats was drastic and maximum value exceeded to 40 C in SUN in daytime ; whereas , variation was moderate in SHA . Moisture content in dung also drastically changed in SUN in association with precipitation , whereas that in SHA was almost saturated over the experimental period . Seed germination rate was greater for SUN than SHA in all plant species ( Figure 1 ) , however , most of the seedlings died during the experimental period in both treatments . This was probably due to high temperature in SUN and deficiency of solar radiation in SHA .

**Conclusions** Location of dung pats severely affects environmental conditions in the dung and therefore plant propagule conditions . The results suggest that both sunny and shading places are inappropriate to establishment of seedlings of the herbaceous plants . More moderate shading created by tall grasses surrounding a dung patch may provide proper environmental condition for seedling establishment .

### References

- Akber , G . , Call , C . A . , Wiedmeier , R . D . , ( 1995 ) . Cattle dungpat microenvironmental effects on germination and establishment of crested wheatgrass . *Arid Soil Research and Rehabilitation* , 9 : 409-422 .  
 Yasue , T . , Matsui , A . , Kondo , S . , Okubo , M . , Asahida , Y . , ( 2000 ) . The characteristics of tree-shade used by grazing cattle in a hilly pasture during summer season . *Grassland Science* , 45 : 335-341 .



**Figure 1** Cumulative number of seed germination (○) and death (▲) of seedlings in SUN (left) and SHA (right) .